Manuscript: Spectral representation of the annual cycle in the climate change signal

Major remarks

The authors applied the delta change method to regional climate model data on a daily basis. Then, they have shown that the corrected climate change signals are impacted by sampling artefacts due to natural climate variability. Consequently they suggest a filtering method to rid of these artefacts. The paper is a valuable contribution to the issue of uncertainty related with simulated and bias corrected climate change signals.

The paper is well written, but there are some generalizations, which are not fully justified/or need more thorough explanation.

The delta change method, as correctly stated by the authors, is the simplest form of bias correction, that only corrects the means. (Mean while its limitations have been identified in the climate research community, especially if changes in variability or extremes shall be considered.) Why the results should be equally relevant for more sophisticated bias correction methods that correct more moments of the original model distribution than only the mean? For example statistical bias correction methods or quantile mapping can affect the whole distribution of daily data.

The authors consider correction factors that are related to the mean annual cycle on a daily basis. In this respect the correction factors automatically include a lot of noise inherently from daily fluctuations of climate. Later on they use moving averages of different lengths and generalize their results.
But often, bias correction factors are derived on a monthly basis, and then only the effect of changes in monthly means is considered (This method does not seem to be mentioned in the manuscript except from one generalization statement in the conclusions.). This is especially the case if the delta change method is used, as this affects only biases in the means.
For me it does not become clear how valid the studies' results are for this common kind of application, so that a clarification would be desirable.

In the abstract, e.g., the authors wrote that spectral method does not perform well in cases of a strong annual cycle and a large relative precipitation change signal. Does this not severely limits its applicability or usability, as information on climate characteristics and projected future changes have to be known in detail over the region of application before the method can be applied?

Consequently I suggest acceptance of the manuscript for publication after minor revisions have been made.

Minor remarks

In the following suggestions for editorial corrections are marked in *Italic*.

Sect. 4 – par. 1 - p. 1168 – line 21
… as a *ratio*) should ...

Sect. 5 – title - p. 1171 – line 7
... climate *models* at ...

Sect. 5.1 – par. 2 - p. 1172 – line 15-24
I could not really follow this part, starting with the statement on penalisation of overfitting.
Please write in a more understandable and less technical way.

Sect. 5.2 – par. 2 - p. 1173 – line 18-19
Remove sentence "The annual cycle ..." as it is just duplicating part of the figure caption.

Sect. 5.2 – par. 6 - p. 1174 – line 16-18
Part about root transformation is very technical and not really understandable without pronounced background knowledge.

Sect. 5.3.2 – par. 1 - p. 1175 – line 17
... for the *seasons* DJF ...